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WHAT IS CLAIMED IS:

- 1. A nuclear fission reactor comprising:
 - a. a core comprising a fissile metal hydride;
 - an atmosphere comprising a hydrogen isotope to which said core is exposed;
 - a non-fissile material that absorbs and desorbs said hydrogen isotope based on temperature;
 - d. a means for controlling said non-fissile material temperature; and
 - e. a means for extracting energy produced in said core
- The nuclear fission reactor of claim 1 wherein said energy extracting means comprises at least one elongated structure containing a flowing nonhydrogenous fluid.
- 3. The nuclear fission reactor of claim 2 wherein said nonhydrogenous fluid comprises at least one nonhydrogenous liquid metal.
- 4. The nuclear fission reactor of claim 3 wherein said at least one liquid metal is selected from the group consisting of liquid potassium and liquid sodium.
- 5. The nuclear fission reactor of claim 2 wherein said at least one elongated structure is configured as a heat pipe.
- The nuclear fission reactor of claim 2 wherein said nonhydrogenous fluid comprises at least one nonhydrogenous gas.
- The nuclear fission reactor of claim 6 wherein said nonhydrogenous gas is selected from the group consisting of helium, argon, nitrogen, and carbon dioxide.

- 8. The nuclear fission reactor of claim 1 wherein said fissile metal hydride comprises fissile uranium hydride.
- 9. The nuclear fission reactor of claim 1 wherein said core consists essentially of U and UH₃ and intermediate states therebetween.
- 10. The nuclear fission reactor of claim 1 wherein said atmosphere consists essentially of said hydrogen isotope.
- 11. The nuclear fission reactor of claim 1 wherein said atmosphere consists essentially of a mixture of deuterium and protium.
- 12. The nuclear fission reactor of claim 10 wherein said atmosphere includes non-essential reactor byproduct gases.
- 13. The nuclear fission reactor of claim 12 additionally comprising a gas extraction apparatus for extracting said non-essential reactor byproduct gases.
- 14. The nuclear fission reactor of claim 13 wherein said gas extraction apparatus comprises at least one gas port in a containment vessel of said nuclear fission reactor.
- 15. The nuclear fission reactor of claim 1 additionally comprising a hydrogen isotope pressurization apparatus for providing hydrogen isotopes to said nuclear fission reactor.
- 16. The nuclear fission reactor of claim 15 wherein said hydrogen isotope pressurization apparatus comprises at least one gas port in a containment vessel of said reactor.

- 17. The nuclear fission reactor of claim 1 additionally comprising a hydrogen isotope extraction apparatus for removing said hydrogen isotopes from said reactor.
- 18. The nuclear fission reactor of claim 1 wherein said non-fissile material comprises a non-fissile metal hydride.
- 19. The nuclear fission reactor of claim 18 wherein said non-fissile material comprises a non-fissile uranium hydride.
- 20. The nuclear fission reactor of claim 19 wherein said non-fissile material consists essentially of U and UH₃ and intermediate states therebetween.
- 21. The nuclear fission reactor of claim 1 additionally comprising a plurality of trays holding said non-fissile material.
- 22. The nuclear fission reactor of claim 1 additionally comprising a neutron reflector between said core and said non-fissile material.
- 23. The nuclear fission reactor of claim 22 wherein said neutron reflector is selected from the group consisting of beryllium and stainless steel.
- 24. The nuclear fission reactor of claim 1 additionally comprising thermal insulation means between said core and said non-fissile material.
- 25. The nuclear fission reactor of claim 1 wherein said fissile metal hydride comprises at least one fissile actinide hydride.

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- 26. The nuclear fission reactor of claim 25 wherein said at least one fissile actinide hydride is selected from the group consisting of hydrides of uranium and plutonium.
- 27. The nuclear fission reactor of claim 25 wherein said core additionally comprises at least one fertile actinide hydride.
- 28. The nuclear fission reactor of claim 27 wherein said at least one fertile actinide hydride is selected from the group consisting of hydrides of U²³⁸ and Th²³².
- 29. A nuclear fission reaction method comprising the steps of:
 - a. providing a nuclear reactor core comprising a fissile metal hydride and a non-fissile hydrogen isotope absorbing and desorbing material within a pressurization vessel;
 - pressurizing said pressurization vessel with an atmosphere comprising at least one hydrogen isotope;
 - increasing said non-fissile hydrogen isotope absorbing and desorbing material temperature to desorb said at least one hydrogen isotope with a concomitant increase in moderation of said nuclear reactor core to establish criticality;
 - d. establishing criticality of said nuclear reactor core to generate a resultant heat energy; and
 - e. extracting said resultant heat energy.